General

Guideline Title

Occupational therapy practice guidelines for children and adolescents with challenges in sensory processing and sensory integration.

Bibliographic Source(s)

Watling R, Koenig KP, Davies PL, Schaaf RC. Occupational therapy practice guidelines for children and adolescents with challenges in sensory processing and sensory integration. Bethesda (MD): American Occupational Therapy Association Press; 2011. 229 p. [401 references]

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

Referral: Diagnostic vs. Intervention Planning Assessment

The occupational therapy process usually begins with a referral initiated by a parent or caregiver, physician, or school personnel. Occupational therapy services are requested when performance limitations are suspected or limitations in adaptive behaviors are observed (e.g., in movement, play skills, self-regulation, fine motor function). In most cases, the evaluation is requested to document the individual's strengths and weaknesses and determine whether intervention is needed to assist the individual in improving engagement in needed and desired activities.

Occupational therapy evaluation may be requested for diagnostic and/or intervention planning purposes. In either case, the evaluation process should include measurement of the individual's abilities across the domain of occupational therapy with specific examination of sensory processing and integration patterns and careful assessment to determine which sensory systems support or inhibit the individual's occupational performance.

Occupational therapy evaluation should include an assessment of sensory processing and integration when referral concerns, report of individuals familiar with the client, results of other evaluations, or clinical observations suggest that dysfunction in sensory processing may be present. Assessment of sensory processing and integration should be conducted whenever conditions in which sensory processing and integration dysfunction are known to coexist or are diagnosed or suspected. These include autism spectrum disorders, fragile X syndrome, attention deficit hyperactivity disorder, developmental disability, postinstitutionalized children, low-birthweight infants, and some mental health disorders. Because dysfunction in sensory processing and integration also can play a role in regulatory disorders in young children, these functions should be evaluated in children ages 0 to 3 years when self-regulation is a concern. When sensory processing and integration deficits are identified, they should be reported to all other members involved in the diagnostic process and to the client and his or her caregivers.

Evaluation

Evaluation occurs formally and informally during all interactions and observations of the client. The evaluation process relies heavily on *clinical reasoning*, in which the occupational therapist synthesizes knowledge of human development and clinical conditions with the information gathered through interaction with the client to gain a greater understanding of the client's occupational performance.

Occupational therapists perform evaluations in collaboration with the client when possible, the client's family, and school staff when appropriate. The two elements of the occupational therapy evaluation are (a) the occupational profile and (b) the analysis of occupational performance. Occupational therapists may use standardized and nonstandardized assessments that are specifically designed for use with children and adolescents with challenges in processing and integrating sensory information, as well as other evaluation tools and methods. Occupational therapists should validate clinical observations with data from standardized assessments.

Occupational Profile

The purpose of the occupational profile is to allow the occupational therapist to gain an understanding of who the client or clients are, identify their needs or concerns, and determine how these concerns affect engagement in occupational performance. In addition, the occupational profile aims to help the therapist understand what is important to the client and what the client finds meaningful. Information for the occupational profile is gathered through formal and informal interviews with the client and significant others. When working with children, the client includes the child as well as significant family members and other care providers. Interviews explore the client's history and experiences; patterns of daily living; and interests, values, and needs.

Development of the occupational profile varies somewhat according to the context of service provision and can be influenced by availability of persons needed to participate in the process. Generally, the occupational profile is developed at the outset of services through a process of inquiry involving all persons who comprise the client. Inquiry focuses on what the client needs and wants to do, his or her interests and motivations, typical routines, past experiences, and current occupations in various contexts. With the client's help, the occupational therapist gains perspective of how the client spends his or her time and how the contexts and environments in which the client lives, learns, and plays support or hinder occupational engagement. An example of a history and occupational profile is included in Appendix D of the original guideline document.

Issues of sensory processing and integration can influence the manner and nature of an individual's engagement in performance skills and patterns. It is important to investigate the nature of the client's choices and preferences for engagement as well as whether special accommodations are made by the family (and school or other agencies or programs when appropriate) for the client. Some questions that may be helpful in addressing these issues and that can be incorporated into the occupational profile are listed in Box 1 of the original guideline document.

The occupational profile identifies the child's occupational history and current occupations in various contexts and discusses typical routines and the child's interests and motivations. Additionally, the profile explores problematic daily routines. The current social supports (e.g., family and friend membership, peer relationships, community resources, intervention programs) are identified to guide information gathering related to functioning and engagement in childhood occupations. The profile also includes concerns, questions, and priorities of the client. To develop the occupational profile for a child with concerns related to sensory processing and integration, interviewing the family using the Canadian Occupational Performance Measure (COPM) can yield information about how and when the sensory processing challenges affect the child and family during daily life. The COPM can be administered to the child and/or a family member to gain insight into the respondent's perspective regarding occupational performance challenges. Additional instruments that may be useful include the Perceived Efficacy and Goal Setting System (PEGS) and Children's Assessment of Participation and Enjoyment and Preferences for Activities of Children (CAPE/PAC). These instruments provide information about a child's participation in activities outside of school along the dimensions of diversity, intensity, physical and social context, and enjoyment. Results can help the occupational therapist understand how sensory processing and integration challenges may be affecting the child's activity preferences.

Information gathered in the occupational profile is used to guide the family-centered evaluation and intervention process. Using this information, the occupational therapist can identify the strengths and limitations of the child and family and, in turn, identify relevant evaluation methods to assess the underlying components of the identified impairments. The evaluation findings are used to establish goals and guide intervention planning.

Evaluation Considerations

Factors that influence the evaluation process are briefly described in the original guideline document.

- *Setting and context considerations*. The setting in which the occupational therapist works influences the focus of the evaluation.
- *Standardized vs. nonstandardized assessments*. Assessment typically involves the use of multiple measures, including both standardized and nonstandardized instruments.
- *Reliability and validity issues*. When measuring a child's abilities, it is important to determine whether the measurements obtained are reliable and valid.

Analysis of Occupational Performance

Evaluation of individuals with challenges in processing and integrating sensory information addresses components of sensory processing (e.g., registration, modulation, discrimination), as well as praxis, functional skills, and organization of behavior. Participation of the child in family, school, and community roles also is addressed in this process. Information from the occupational profile is used by the occupational therapist to determine the specific areas of occupation and contexts to address. Analysis of occupational performance includes the following steps:

- Observe the client performing activities in the natural or least restrictive environment, and note the effectiveness of the client's performance skills (e.g., motor, praxis, sensory–perceptual, emotional regulation, social) and performance patterns (e.g., habits, routines, rituals, roles).
- Select specific assessment tools and methods that will identify and measure factors related to sensory processing and integration that may be influencing the client's performance.
- Interpret the assessment data to identify which aspects of sensory processing and integration support and which hinder performance.
- Develop or refine a hypothesis regarding the client's performance.

Analysis of occupational performance culminates in a collaborative process of developing goals that address the desired outcome for the client. With consideration for the evaluation results, desired outcomes, and scientific evidence, the occupational therapist then identifies potential intervention approaches and discusses them with the client. Finally, the evaluation process and results are documented and communicated to the family, appropriate team members, and community agencies.

Participation in Areas of Occupation

Individuals with challenges in processing and integrating sensory information often have performance limitations in one or more areas of occupation. Depending on the concerns identified for the individual being assessed, play performance, school-related occupations, leisure and social participation, and adaptive behavior and activities of daily living may be evaluated.

Play

Play is a child's main occupation and therefore requires special attention in the evaluation.

In order to understand the way in which sensory processing and integration may be supporting or hindering a child's ability to play, assessment of play should be supplemented by skilled observation of the manner in which the child plays. Assessment of play should describe a child's level of play skills and take into account the qualitative and contextual aspects of the play. Some key features to incorporate into observations of play are provided in Table 1 of the original guideline document. These may be especially useful when time or contextual factors preclude structured evaluation of play skills.

School Occupations

Analysis of the child's school-related occupations helps the therapist develop an understanding of how the sensory aspects of the classroom, playground, auditorium, cafeteria, library, and other school environments support or inhibit the child's ability to be successful as a learner, peer, and participant in school and extracurricular activities. Initial information is gathered from the family and school personnel regarding their concerns about the child's strengths and areas of challenge within the school context. Evaluation of school-based performance can be accomplished through use of the School Function Assessment (see the original guideline document for other assessment tools).

Adaptive Behavior and Activities of Daily Living

Measurement of performance in activities of daily living (ADLs) is important for understanding the effect of sensory processing and integration on daily life skills. Evaluation of ADLs can be accomplished using both observation and formal assessments.

Leisure and Social Participation

Sensory processing patterns can influence an individual's leisure choices and social participation behaviors. Information about these areas of occupation can be gathered through interview (using questions about choices and preferences), formal assessment (see Table 2 in the original guideline document), and informal methods such as interest checklists and observations.

Analysis of Performance Skills and Performance Patterns

Motor and Praxis Skills

Assessment of motor performance involves evaluation of foundations for movement such as postural stability and neurodevelopment, including muscle tone.

Assessment of muscle tone is best accomplished through clinical observations of posture and movement and palpation of the muscle belly.

In addition to measuring the child's performance on specific gross motor test items, the occupational therapist observes the child during standardized test activities and documents the quality of the child's performance, noting aspects such as organization, initiation, termination, and fluidity of movement, as well as overall coordination. Information about the consistency with which gross motor skills are demonstrated across environments and settings can be obtained through interview with the child's caregiver.

The client's skill in integrating cognition, sensation, and motor skills for praxis is challenging to measure. A few formal assessments are available that specifically evaluate this complex skill.

Additional information about a child's practic abilities can be obtained through structured and unstructured clinical observations.

Fine/Visual–Motor Development

Occupational therapy assessment of fine motor skill typically occurs through administration of standardized tests in conjunction with observations of engagement in purposeful fine motor tasks.

Qualitative observations should address specifically whether tactile, proprioceptive, and visual input support or inhibit fine and visual motor performance. Suggested questions to guide observations are provided in Table 3 of the original guideline document.

Sensory–Perceptual Skills

Sensory perception includes visual, auditory, tactile, vestibular, proprioceptive, gustatory, and olfactory sensations.

Evaluation of sensory–perceptual skills in occupational therapy is guided by an understanding of the relationship between sensation and functional behavior and as such occurs within the context of occupational performance.

A variety of formal visual–perceptual tests are available for use by occupational therapists (see Table 2 in the original guideline document).

Specific evaluation of *sensory processing and integration* includes both formal and informal methods. Table 2 in the original guideline document includes selected assessments that may be used when evaluating sensory processing and integration in children.

In addition to performance-based measures, caregiver report measures can be used to gather data about the child's typical functioning in home and school environments.

As with all other areas evaluated by occupational therapists, assessment of sensory processing that is completed with standardized and nonstandardized tools is complemented with observations. Observations of sensory processing and integration can occur through structured and unstructured methods, depending on what questions the therapist seeks to answer and the capacity of the child to comply with structure and engage in directed activities.

Emotion Regulation

Because of the multiple neuropsychophysiological mechanisms involved, evaluation of specific emotion regulation is complex. Observation of behaviors such as emotional reactivity to stimuli, intensity of response, ability to calm or recover following an intense response, latency and duration of response, and match between emotional response and contextual factors are important aspects of emotion regulation assessment. Current tools that may be used when measuring emotion regulation are those questionnaires designed to measure sensory processing that include subsets of questions addressing this area (refer to the original guideline document for specific tools).

Cognitive Skills

Although specific and thorough measurement of cognitive skills typically is performed by a psychologist, occupational therapists intentionally consider the impact of cognitive abilities on the child's occupational performance. Some aspects of cognition that may be considered specifically during evaluation by an occupational therapist include the child's ability to select appropriate materials for a task, sequence steps within a task or activity, organize activities in time and space, plan what to do, and generate new ideas.

Communication and Social Skills

Formal evaluation of communicative abilities usually is performed by a speech–language pathologist; however, occupational therapists, through their interaction with the client, become aware of any communicative difficulties and seek to understand how they influence the client's performance and social interaction.

Assessment of social skills includes measurement of skills necessary for interacting with others, such as using gestures or interpreting the gestures of

others, initiating interaction, taking turns, and maintaining appropriate physical space in relation to others. Social skills assessment is conducted through both formal and observational measures. Formal measures include standardized test instruments that rely on reports of the caregiver or other adults who know the child well or tools that use self-report by the child (see Table 2 in the original guideline document). Observations of social interactions with peers can be conducted in natural settings, whereas social interactions with adults can occur through natural observations as well as during the evaluation process. Suggested observations of social skills are identified in Table 4 of the original guideline document.

Performance Patterns

Examination of the daily routine of the client within the family, school, and community provides information about the client's patterns of engagement and participation. Questions about whether the client has established habits, routines, or rituals should be incorporated into interviews, as should inquiry about the usual role the client fills in each of the groups and contexts in which he or she regularly participates.

Contexts and Environments

Contexts are identified as the cultural, personal, temporal, and virtual factors that exist within and around a person. *Environments* are those external physical and social factors that surround the client.

Evaluation of performance and behaviors across various settings is important, and the contextual and environmental factors that support or inhibit performance should be identified during the evaluation process.

Information on the pattern of engagement in various contexts allows the therapist to evaluate the contributions of different conditions to the individual's performance and can help the therapist begin devising a plan for how to structure the environment during intervention activities. Consideration should be given the sensory aspects of both human and nonhuman facets of the environment. Elements of context that should be considered during evaluation are listed in Table 5 of the original guideline document.

Activity Demands

During evaluation, the occupational therapist observes the child's performance and the impact of the activity demands, including any supports or modifications that the child relies on to increase success. The therapist may provide varying forms and levels of assistance to determine whether a change in activity demands alters the child's occupational performance. The therapist aims to balance the level of assistance offered to create the "just-right challenge" with regard to activity demands.

Table 5 in the original guideline document identifies aspects of activity demands that should be addressed during evaluation.

Client Factors

Client factors include the values, beliefs, and spirituality; body functions; and body structures that affect the individual's occupational performance.

Evaluation of these client factors (e.g., body functions) includes measuring the function of specific sensory systems as well as the detection/registration, modulation, and integration of sensation.

Interpretation of Evaluation Results

Determining the meaning of the evaluation results requires synthesis of all evaluation data from multiple sources to identify the client's strengths and any areas of engagement, participation, and performance for which the client needs intervention. The occupational therapist synthesizes all assessment data and looks for patterns and convergence in the data to form a cohesive image of the child's participation in daily activities and the ways the child's sensory processing and integration patterns affect engagement and participation. Evaluation data are interpreted with consideration of the child's ability to register and discriminate sensory information, self-regulate behavioral responses to sensory stimuli, and integrate sensory information with cognitive and motor functions to demonstrate effective practic abilities. The occupational therapy evaluation results are integrated with those of other professionals, if available, to gain a more comprehensive understanding of the effect of sensory processing and integration on various aspects of function, including strengths and limitations in performance. This information guides development of the intervention plan, including which combinations of sensations provided during meaningful activities can be used to support performance.

Intervention

Occupational therapy practitioners use the information about the child or adolescent and his or her family gathered during the evaluation to direct client-centered and occupation-based interventions. The intervention process consists of the skilled actions taken by occupational therapy practitioners in collaboration with the child and other service providers and the family to facilitate engagement in occupation related to health and participation. This intervention process is divided into three steps: (1) planning, (2) implementation, and (3) review. During the intervention process, information from the evaluation is integrated with theory, practice, frames of reference, intervention methods, and evidence from the literature. This

information guides the clinical reasoning of the occupational therapist in the development, implementation, and review of the intervention plan.

Clinical Reasoning

Clinical reasoning is a complex and multifaceted process in which the practitioner dynamically uses a variety of metacognitive processes to consider scientific knowledge of the client's condition, the meaning of the condition to the client, the practical issues that might affect delivery of services to the client, moral issues that may affect therapeutic choices or actions, and knowledge and skills related to interpersonal relationships and interactions.

The clinical reasoning process begins when the occupational therapy practitioner first reviews the request for services for the client, and it continues throughout the process of preparing for, conducting, and reflecting on the evaluation and intervention sessions.

Intervention Plan and Intervention Implementation

The occupational therapist develops the intervention plan collaboratively with the client, basing it on the client's goals and priorities. Depending on whether the client is a person, organization, or population, others, such as family members, significant others, board members, service providers, and community groups, also may collaborate in the development of the plan. The selection and design of the intervention plan and goals are directed toward addressing the client's current and potential problems related to engagement in occupations and/or activities. The design of the intervention plan is directed by the following: (1) client's goals, values, and beliefs; (2) client's health and wellbeing; (3) client's performance skills and performance patterns; (4) collective influence of activity demands, client factors, and the context, which includes the environment; (5) context of service delivery in which the intervention is provided; and (6) best available evidence.

The goal of intervention for children and adolescents with challenges in sensory processing and sensory integration is to promote successful engagement in areas of occupation by addressing performance limitations in key areas such as play and leisure, social participation, education, rest and sleep, and ADLs. Occupational therapists provide intervention using sensory integration and sensory-based approaches to address difficulties across all areas of occupation. The specific emphasis is on sensory modulation disorders linked to emotion regulation difficulties, deficits related to motor and praxis skills, and sensory–perceptual skills.

Collaboration

Throughout the assessment and intervention process, the occupational therapy practitioner collaborates with the family, child, and team members to establish meaningful goals and identify relevant outcomes.

Intervention Review and Outcome Monitoring

Intervention review is a continuous process of reevaluating and reviewing the intervention plan, the effectiveness of its delivery, and the progress toward targeted outcomes. This regular monitoring of the results of occupational therapy intervention determines the need to continue or modify the intervention plan, discontinue intervention, provide follow-up, or refer the client to other agencies or professionals. Reevaluation may involve readministering assessments used at the time of initial evaluation, parent or client completion of a satisfaction questionnaire, or practitioner–client interview using individually developed questions that evaluate the status of each client goal.

Monitoring Progress

Progress is monitored both formally and informally through standardized assessments; clinical observations; and contextual data from families, teachers, and related personnel and is related directly to the functional outcomes.

Transition

Children transition throughout their schooling to different settings, grades, and situations. Under the Individuals with Disabilities Education Improvement Act (IDEA), children with disabilities are entitled to transition planning and services at two points in time: when the child moves from early intervention (Part C) into preschool and kindergarten (Part B) and when the student moves from high school to postsecondary education and community living. As part of the transition team, occupational therapy practitioners support positive transition outcomes to prepare the family and child for changes in roles and routines; facilitate academic and functional living skills for school participation; and facilitate community integration, including skills for employment, further education, and adult living. The occupational therapy practitioner also provides extensive information to the family about the new setting and program, explains how expectations for the child will change, and facilitates communication with the providers of the child's future program. Interventions are reviewed and outcomes are monitored to develop new individualized education program (IEP) goals and specially designed services for the child that are appropriate to the new setting and staff within that setting.

Transition planning may include postsecondary education, vocational training, integrated employment (including supported employment), continuing and adult education, adult services, independent living, and community participation.

Discontinuation, Discharge Planning, and Follow-Up

Like transition, discontinuing and discharging from services requires planning and should begin at the time services are initiated. During the annual review of services provided under IDEA, a practitioner, as part of the IEP team, may recommend discontinuation of services when the student either has met goals requiring occupational therapy collaboration and no additional goals are appropriate or when the student has achieved maximal benefit from occupational therapy services. In addition, services may be discontinued if they no longer are needed; at the request of the family; or if the child is unable to participate because of extenuating medical, financial, social, or psychological challenges. As part of the discharge process, occupational therapists document the plan for discontinuing services, including a summary of progress and recommended follow-up, if any.

Occupational therapy services may be requested and required at different points in the development of children and adolescents with challenges in sensory processing and sensory integration. Therefore, additional intervention may be needed following discharge from services if the child's developmental profile and/or the contexts (e.g., home and community; day care; classroom; or other school environments such as art, music, physical education, playground, cafeteria, or bus) that affect occupational performance are changed. In addition to a formal request, routine follow-up may be conducted within various settings. In a school setting, routine follow-ups may be done as part of ongoing educational screening efforts. Private clinics and diagnostic centers may conduct follow-up services to monitor developmental progress and provide program planning recommendations. Additionally, practitioners in some settings may follow up with a client via phone, letter, or questionnaire as part of ongoing quality assurance measures. In any case, follow-up is an important component of the occupational therapy process.

Documentation, Billing, and Reimbursement

The following types of documentation may be completed for each client, as required by law, the practice setting, third-party payers, or some combination of these:

- Occupational therapy evaluation, including history and results of special testing or assessments
- Occupational therapy intervention plan, including goals and objectives
- Progress reports
- Prescription/recommendation for adaptive equipment
- Reevaluation reports
- Discharge or discontinuation report

It is essential that occupational therapy practitioners document how the problems in sensory processing and integration affect functional behaviors and engagement in daily occupations in their clients and write intervention plans with clear long- and short-term goals that are objective, functional, and measurable. Such documentation can aid in obtaining reimbursement for occupational therapy services provided. Appendix E of the original guideline document provides guidelines for occupational therapy evaluation and intervention billing using CPT™ codes. Occupational therapy practitioners should use the most relevant CPT code based on the specific services provided, patient goals, and payer coding policy.

Summary of Recommendations for Occupational Therapy Interventions

Recommendations for occupational therapy practice for children and adolescents with challenges in processing and interpreting sensory information can be found in the following table. The recommendations are based on the strength of the evidence for a given topic from the intervention questions in combination with the expert opinion of the review authors and content experts reviewing this guideline. The strength of the evidence is determined by the number of articles included in a given topic, the study design, and limitations of those articles. Recommendation criteria are based on standard language developed by the U.S. Preventive Services Task Force of the Agency for Health Care Research and Quality (see definitions following the table).

Table. Recommendations for Occupational Therapy Interventions for Children and Adolescents with Challenges in Processing and Integrating Sensory Information

	Recommended*	No Recommendation	Not Recommended
Areas of Occupation	• Occupational therapy using a sensory integration approach for performance on individual functional goals for children with problems in sensory processing (C) • A combination of sensory integration, sensory diets, and therapeutic riding to address performance on functional, parent-centered goals in children with problems with sensory	• Sensory integration for academic and psychoeducational performance (e.g., math, reading, written language) (I)	

Table. Recommendations for Occupational Therapy Interventions for Children and Adolescents with Challenges in Processing and Integrating Sensory Information

	Recommended*	No Recommendation	Not Recommended
	processing (C) • Sensory integration for participation in active play for children with sensory processing disorder (C) • Sensory integration to address play skills and engagement for children with autism (C) • A cognitive and task-based approach to address participation in occupations for children with motor deficits characteristic of developmental coordination disorder (DCD) (B) • Movement therapy for on-task passive behaviors in children with autism (C)	• Exercise for play behavior in children with autism (I)	
Performance Skills			
Motor and Praxis Skills	• Sensory integration for gross motor and motor planning skills for children with learning disabilities (B) • A cognitive and task-based approach for motor skills for children with motor deficits characteristic of DCD (B) • Mental imagery to address performance on motor skills for children with attention and learning problems (C) • Motor imagery programs for performance on motor skills for children with problems in motor coordination (C) • Sensorimotor techniques to address motor performance and reduce falls in children with DCD (C)	• Perceptual–motor training for motor performance for children with learning problems (I)	
Sensory–Perceptual Skills	• Occupational therapy using a sensory integration approach to address sensory processing skills for children with problems in sensory processing (C) • Sensory integration approach for visual perception in children with DCD (C) • A combined sensory diet plus therapeutic listening program to address areas of sensory processing for children with sensory processing disorders and visual–motor delays (C) • Sensory integration combined with perceptual–motor curriculum for visual, auditory, and tactile perception for children with suspected neurological problems (C)	• Sensorimotor activities for sensory organization for children with DCD (I)	
Emotional Regulation Skill	• Sensory integration to address maladaptive behaviors in children with problems in sensory processing (B) • Sensory integration to address self-esteem in children with learning disabilities and sensory integrative dysfunction (B) • Occupational therapy using a sensory integration approach for decreasing externalizing and internalizing behaviors in children with problems in sensory processing (C) • A combination sensory diet plus therapeutic listening program for improvements in behavior for children with sensory processing disorders and visual–motor delays (C)	• Sound therapy to address behavior for children with autism (I)	
Communication and Social Skills	• Occupational therapy using a sensory integration approach to address socialization in children with problems in sensory processing (C) • Sensory integration for engagement and reduced aggression in children with sensory modulation disorder (C)	• Sound therapy for improved language skills for children with autism (I)	

Table. Recommendations for Occupational Therapy Interventions for Children and Adolescents with Challenges in Processing and Integrating Sensory Information			
	Recommended*	No Recommendation	Not Recommended
Client Factors			
Mental Functions	• Sensory integration for attention in children with autism (C) • Weighted vests to address attention in children with pervasive developmental disorder and sensory processing disorder (C)		
Sensory Function and Pain	• Occupational therapy using a sensory integration approach to reduce the amplitude of electrodermal responses in children with problems in sensory modulation, indicating a decreased stress response to repetitive and potentially noxious sensory stimuli (B) • Touch pressure/deep pressure and massage to address touch aversion and improved responsiveness to sound in children with autism (B) • Sensory integration to increase nystagmus in children with learning disabilities (C) • Sensory integration to address tactile discrimination for children with suspected neurological problems (C) • Physical exercise to reduce self-stimulatory behaviors for children with autism (C) • Movement therapy to decrease negative responses to touch for children with autism (C)	• Sensory integration to increase nystagmus in children with reading delays and problems in sensory integration (I)	
Consultation	• Occupational therapy provided on a consultation basis was effective for service delivery for children with sensory integration dysfunction, DCD, and learning problems (A)		
	• A sensory integration approach for improved social interaction and reduced disruptive behaviors in children with autism (C) • Massage for social communication in children with autism (C)		

*The terminology used for the recommendations is language used in the article from which the evidence is derived.

Definitions:

Strength of Recommendation

A - There is strong evidence that occupational therapy practitioners should routinely provide the intervention to eligible clients. Good evidence was found that the intervention improves important outcomes and concludes that benefits substantially outweigh harm.

B - There is moderate evidence that occupational therapy practitioners should routinely provide the intervention to eligible clients. At least fair evidence was found that the intervention improves important outcomes and concludes that benefits outweigh harm.

C - There is weak evidence that the intervention can improve outcomes, and the balance of the benefits and harms may result either in a recommendation that occupational therapy practitioners routinely provide the intervention to eligible clients or in no recommendation because the balance of the benefits and harm is too close to justify a general recommendation.

I - Insufficient evidence to determine whether or not occupational therapy practitioners should routinely provide the intervention. Evidence that the intervention is effective is lacking, of poor quality, or conflicting and the balance of benefits and harm cannot be determined.

Note: Criteria for level of evidence (A, B, C, I, D) are based on standard language (see Agency for Healthcare Research and Quality, 2009). Suggested recommendations are based on the available evidence and content experts' clinical expertise regarding the value of using the intervention in practice.

Levels of Evidence for Occupational Therapy Outcomes Research

Levels of Evidence	Definitions
Level I	Systematic reviews, meta-analyses, randomized controlled trials
Level II	Two groups, nonrandomized studies (e.g., cohort, case–control)
Level III	One group, nonrandomized (e.g., before and after, pretest and posttest)
Level IV	Descriptive studies that include analysis of outcomes (e.g., single subject design, case series)
Level V	Case reports and expert opinion that include narrative literature reviews and consensus statements

Adapted from "Evidence-Based Medicine: What It Is and What It Isn't," by D. L. Sackett, W. M. Rosenberg, J. A. Muir Gray, R. B. Haynes, & W. S. Richardson, 1996, *British Medical Journal*, 312, pp. 71–72.

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Challenges in sensory processing and sensory integration

Guideline Category

Counseling

Diagnosis

Evaluation

Management

Rehabilitation

Treatment

Clinical Specialty

Family Practice

Neurology

Pediatrics

Physical Medicine and Rehabilitation

Psychiatry

Psychology

Speech-Language Pathology

Intended Users

Advanced Practice Nurses

Health Care Providers

Managed Care Organizations

Occupational Therapists

Physical Therapists

Physician Assistants

Physicians

Psychologists/Non-physician Behavioral Health Clinicians

Social Workers

Speech-Language Pathologists

Utilization Management

Guideline Objective(s)

- To provide an overview of the occupational therapy process for children and adolescents with challenges in processing and integrating sensory information
- To define the occupational therapy domain, process, and intervention that occur within the boundaries of acceptable practice
- To help occupational therapists and occupational therapy assistants, as well as individuals who manage, reimburse, or set policy regarding occupational therapy services, understand the contribution of occupational therapy in evaluating and serving children and adolescents with challenges in processing sensory information
- To serve as a reference for parents; school administrators, educators, and other school staff; health care facility managers; education and health care regulators; third-party payers; and managed care organizations

Target Population

Children and adolescents with challenges in processing and integrating sensory information

Interventions and Practices Considered

1. Referral for occupational services (diagnostic vs. intervention planning assessment)
2. Evaluation
    - Developing the occupational profile
    - Analysis of occupational performance through observation and assessment
3. Developing an intervention plan
4. Intervention implementation through creating, establishing, modifying, maintaining performance of, and preventing disability in daily living skills; rest and sleep; education and work; and play, leisure, and social participation
    - Sensory integration (SI) interventions
    - Non-SI interventions
5. Intervention review
6. Outcome monitoring
7. Transition planning
8. Discharge and discontinuation planning
9. Follow-up
10. Documentation

Major Outcomes Considered

- Occupational performance
- Quality of life
- Role competence
- Self-advocacy
- Occupational justice

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

The following questions guided the selection of research studies for the review, synthesis, and interpretation of the findings:

1. *Neuroscience*: What is the neurophysiologic evidence that using a sensory-based approach in occupational therapy with children and adolescents will be effective?
2. *Neuroscience/Subtyping*: What is the evidence for the existence of different types of sensory integration (SI)/sensory processing problems in children and adolescents?
3. *Occupational Therapy SI Intervention*: What is the effectiveness of SI interventions (including the effect of context) in creating, promoting, establishing, restoring, maintaining, modifying, and preventing future limitations in activities of daily living (ADLs), instrumental activities of daily living (IADLs), education/transition, play/leisure, and social participation in children and adolescents whose sensory processing patterns interfere with everyday life participation?
4. *Occupational Therapy Non-SI Intervention*: What occupational therapy interventions (including the effect of context) are effective in creating, promoting, establishing, restoring, maintaining, modifying, and preventing future limitations in ADLs, IADLs, education/transition, play/leisure, and social participation in children and adolescents whose sensory processing patterns interfere with everyday life participation?
5. *Occupational Performance*: What kinds of difficulties do children and adolescents with problems in SI/sensory processing demonstrate in ADLs, IADLs, education, work/transition, play/leisure, and social participation?

Methodology

Databases and sites searched included Medline, PsycINFO, CINAHL, ERIC, BIOSIS Previews, Science Citation Index, Social Science Citation Index, RehabData, and OTseeker. In addition, consolidated information sources, such as the Cochrane Database of Systematic Reviews and the Campbell Collaboration, were included in the search. These databases are peer-reviewed summaries of journal articles and provide a system for clinicians and scientists to conduct evidence-based reviews of selected clinical questions and topics. Moreover, reference lists from articles included in the systematic reviews were examined for potential articles, and selected journals were hand-searched to ensure that all appropriate articles could be included.

Search terms for the review were developed by the consultant to the American Occupational Therapy Association (AOTA) Evidence-Based Literature Review Project and AOTA staff in consultation with the authors of each question and reviewed by the advisory group. The search terms were developed not only to capture pertinent articles but also to make sure that the terms relevant to the specific thesaurus were included. A medical research librarian with experience in completing systematic review searches conducted all searches and confirmed and improved the search strategies. In addition, a filter based on one developed by McMaster University was used to narrow the search to research studies. In addition to these general steps, procedures specific to each question are described below.

Inclusion and exclusion criteria are critical to the systematic review process because they provide the structure for the quality, type, and years of publication of the literature incorporated into a review. The review of all five questions was limited to peer-reviewed scientific literature published in English. The review also included consolidated information sources such as the Cochrane Collaboration. Except as described here, the literature

included in the review was published between 1986 and 2006. The review excluded data from presentations, conference proceedings, non–peer-reviewed research literature, research reports, dissertations, and theses.

The search strategy for Question 1 (neuroscience) included *neuronal plasticity or neuroplasticity or neural plasticity (limited to humans) PLUS sensory systems (vision, tactile, auditory, olfactory, gustatory, proprioception, vestibular, temperature) PLUS diagnoses (attention deficit hyperactivity disorder OR ADHD, autism, brain injury, stroke, learning disabilities, nonverbal learning disabilities, developmental coordination disorder)*. Studies were limited to those that included the following measures: functional magnetic resonance imaging (fMRI), MRI, electrodermal response (EDR), electrodermal activity (EDA), skin conductance, and electroencephalography (EEG). In addition, the publication lists of authors of classic animal studies also were reviewed. Animal studies of these authors were included if the study focused on neuroplasticity, and the article was included in the review regardless of publication date (see the original guideline document for author names included in the review). The citations of 2,499 human studies and 1,658 animal studies were reviewed, for a total of 4,157 citations. Sixty-six articles were initially reviewed, and 49 were incorporated into the systematic review.

The neuroscience/subtyping (Question 2) and performance questions (Question 5) both used the same search terms to identify and capture applicable articles. Search terms included in these reviews were *discrimination (sensory, tactile, visual/spatial, proprioceptive, and auditory), dyspraxia, emotional regulation, hypersensitivity, hypotonia, overresponsiveness, oversensitivity, postural disorder, sensation seeking, sensorimotor or sensory motor, sensory based motor disorder, sensory defensiveness, underresponsiveness*. The results for several of the search terms (*discrimination, hypersensitivity, hypotonia, sensation seeking, sensorimotor*, and *sensory motor*) were limited to those articles pertaining to diagnostic categories included in the intervention questions. A complete list of diagnostic categories and clinical conditions is included in Table B2 of the original guideline document. Five hundred and forty citations were reviewed for subtyping (Question 2) and performance (Question 5). For subtyping (Question 2), 95 articles were retrieved, and 57 were included in the final selection and review process.

The occupational performance review (Question 5) was completed, in part, as an academic partnership among the review author, graduate students, and AOTA staff and consultant. The review author worked on the review with a group of entry-level master's students for a project to fulfill requirements for a capstone research course. The 540 citations cited previously provided the initial group of articles for the review; searches through 2008 yielded additional citations. Other later modifications to the search strategy were the inclusion of articles specifically on developmental coordination disorder, because it is frequently used as a synonym for dyspraxia, and the limitation of articles on performance issues in autism spectrum disorder to those studies incorporating a measure of sensory performance.

Selected articles met the following inclusion criteria:

- Participant demonstration (through observation or assessment) of limitation in occupational performance
- Presence of a comparison group that included participants with relevant diagnostic categories or a sensory processing deficit affecting performance
- Descriptive articles that included data on performance deficits in areas of occupation

Studies that lacked either an occupational performance component or an assessment of occupational performance were excluded. Thirty-five articles were included in the systematic review on performance.

The search terms for Questions 3 and 4 (occupational therapy interventions using SI and non-SI approaches) are listed in Table B2 of the original guideline document. Studies of intervention effectiveness were included if the described intervention was within the domain of occupational therapy, although it did not have to be a common occupational therapy intervention or administered by an occupational therapist or occupational therapy assistant. The following inclusion criteria were specific to this review: Participants in the intervention study were age 21 and younger; the search was limited to 1996 to 2006, but earlier systematic reviews and classic articles that may or may not have been incorporated into a systematic review also were included; and selected articles published in 2007 were recommended by experts in the field and included in the review. A total of 1,079 citations were reviewed. Thirty-two articles were included in the systematic review of SI approaches, and 20 articles (reporting on 21 studies) were included in the review of non-SI intervention approaches.

Number of Source Documents

A total of 194 articles were included in the review of the five focused questions.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Levels of Evidence for Occupational Therapy Outcomes Research

Levels of Evidence	Definitions
Level I	Systematic reviews, meta-analyses, randomized controlled trials
Level II	Two groups, nonrandomized studies (e.g., cohort, case–control)
Level III	One group, nonrandomized (e.g., before and after, pretest and posttest)
Level IV	Descriptive studies that include analysis of outcomes (e.g., single subject design, case series)
Level V	Case reports and expert opinion that include narrative literature reviews and consensus statements

Adapted from "Evidence-Based Medicine: What It Is and What It Isn't," by D. L. Sackett, W. M. Rosenberg, J. A. Muir Gray, R. B. Haynes, & W. S. Richardson, 1996, *British Medical Journal*, 312, pp. 71–72.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The teams working on each focused question reviewed the articles according to their quality (scientific rigor and lack of bias) and levels of evidence. In addition to Level I, II, III, IV, and V evidence, 2 qualitative studies were included in the occupational performance review. The team abstracted each article included in the review using an evidence table that provides a summary of the methods and findings of the article and an appraisal of the strengths and weaknesses of the study based on design and methodology. The evidence tables of all articles included in the review can be found in Appendix C of the original guideline document. Review authors also completed a Critically Appraised Topic (CAT), a summary and appraisal of the key findings, clinical bottom line, and implications for occupational therapy of the articles included in the review for each question. American Occupational Therapy Association (AOTA) staff and the evidence-based practice (EBP) project consultant reviewed the evidence tables and CATs to ensure quality control. All review authors were either doctoral-level trained occupational therapists with expertise in the content area examined by the focused question or graduate students or master's-level trained occupational therapists under the guidance and direction of the review author.

The articles included in the systematic reviews have several overarching limitations. Several of the studies in all five systematic reviews had small sample sizes, which reduced the power of the statistical analysis. In addition, there was a lack of blinding, and group (both intervention and control) characteristics frequently were not described in enough detail to allow for replication. In some studies, it was difficult to distinguish the intervention and control groups because of the similarity of the groups. Many studies included in the reviews did not control for medication use, and variations in medication use by participants may have affected the results. Outcomes were based on parent report in several studies, and the variety of outcome measures used in the studies may make it difficult to group the results of studies. Where heterogeneous populations have been noted, the authors indicated that the results must be interpreted with caution. In addition, studies that included a select or limited diagnosis could reduce the generalizability to other populations. Studies at lower levels of evidence lacked randomization and a control group, making it difficult to generalize results to other samples.

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

The findings from studies included in the systematic reviews also were used to develop evidence-based recommendations. The recommendations are based on the strength of the evidence for a given topic from the systematic reviews in combination with the expert opinions of the review authors and content experts reviewing this guideline. The strength of the evidence is determined by the number of articles included in a given topic, the study design, and limitations of those articles. The review authors and other context experts provided clinical expertise regarding the value of using a given intervention in practice. Recommendation criteria are based on standard language developed by the U.S. Preventive Services Task Force of the Agency for Health Care Research and Quality. More information regarding these criteria can be found at http://www.uspreventiveservicestaskforce.org/uspstf/standard.htm.

Rating Scheme for the Strength of the Recommendations

Strength of Recommendation

A - There is strong evidence that occupational therapy practitioners should routinely provide the intervention to eligible clients. Good evidence was found that the intervention improves important outcomes and concludes that benefits substantially outweigh harm.

B - There is moderate evidence that occupational therapy practitioners should routinely provide the intervention to eligible clients. At least fair evidence was found that the intervention improves important outcomes and concludes that benefits outweigh harm.

C - There is weak evidence that the intervention can improve outcomes, and the balance of the benefits and harms may result either in a recommendation that occupational therapy practitioners routinely provide the intervention to eligible clients or in no recommendation because the balance of the benefits and harm is too close to justify a general recommendation.

I - Insufficient evidence to determine whether or not occupational therapy practitioners should routinely provide the intervention. Evidence that the intervention is effective is lacking, of poor quality, or conflicting and the balance of benefits and harm cannot be determined.

D - Recommend that occupational therapy practitioners do not provide the intervention to eligible clients. At least fair evidence was found that the intervention is ineffective or that harm outweighs benefits.

Note: Criteria for level of evidence (A, B, C, I, D) are based on standard language (see Agency for Healthcare Research and Quality, 2009). Suggested recommendations are based on the available evidence and content experts' clinical expertise regarding the value of using the intervention in practice.

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Peer Review

Description of Method of Guideline Validation

Not stated

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

A total of 194 articles were included in the review of the five focused questions. One hundred and thirty-six (70%) of the articles were at Level I or Level II, indicating that the review incorporated evidence at the highest levels. The table below presents the number of studies included in the complete review, those included in each focused question, and the composition of the articles included in the review by level of evidence.

Number of Articles Included in Review							
Review Question	Level I	Level II	Level III	Level IV	Level V	Qualitative	Total in Each Review
Neuroscience	9	27	11	1	1	0	49
Neuroscience/Subtyping	4	44	8	1	0	0	57
Occupational Therapy SI Intervention	18	4	4	6	0	0	32
Occupational Therapy Non-SI Intervention	9	2	3	7	0	0	21
Occupational Performance	0	19	11	2	2	1	35
Total for Each Level	40	96	37	17	3	1	
Total In All Reviews							194

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate evaluation and treatment of children and adolescents with challenges in sensory processing and sensory integration

Potential Harms

Safety and Risk Issues

- There are risks associated with a variety of intervention strategies used in treating children and adolescents with challenges in processing and integrating sensory information.
- In a clinical setting, the physical environment when using occupational therapy with sensory integration intervention often has large, suspended equipment, and safety must be maintained within the therapy environment. Suspended equipment must be hung securely to a supporting beam or freestanding structure designed to suspend equipment. Mats, cushions, and pillows are used to pad surfaces around the therapy room and under any suspended equipment. All equipment must be checked routinely and monitored in order to maintain safety. The equipment is manufactured to provide tactile, proprioceptive, and vestibular input under the guidance of a trained therapist.
- During intervention, the occupational therapy practitioner must stay close to the child and be ready to quickly move and stabilize the child and/or the equipment. Particular attention should be given when the child is in an inverted position to protect his or her head and neck position and when making fast rotary movements to ensure that the child is safe throughout the activity. The occupational therapy practitioner needs to closely monitor the child's response during participation in sensory-based activities. Activation of the vestibular system, although organizing for many children, may produce strong autonomic nervous system responses, including nausea or blanching, and can affect arousal, producing distractible, unfocused behavior. Weighted vests and weighted blankets may be used to provide the child with sustained deep tactile input; the child's response to this input must be monitored, and the therapist must be careful not to use excessive weight relative to the child's size. Currently, there is no standardized protocol that has demonstrated efficacy with weighted vest or blanket, use and the occupational therapist must have a clear occupation-focused rationale for using this equipment and monitor the child's individual response to this intervention. In a school-based context, occupational therapy using a sensory integration approach usually is provided in the natural context of the child's classroom or other school environments, and safety considerations should be customized to the nature of each environment. Advanced training should include safe use of equipment and monitoring of the child's response to sensory stimulation across contexts and environments.

Qualifying Statements

Qualifying Statements

- This guideline does not discuss all possible methods of care, and although it does recommend some specific methods of care, the occupational therapist makes the ultimate judgment regarding the appropriateness of a given procedure in light of a specific client's circumstances and needs.
- This publication is designed to provide accurate and authoritative information in regard to the subject matter covered. It is sold or distributed with the understanding that the publisher is not engaged in rendering legal, accounting, or other professional service. If legal advice or other expert assistance is required, the services of a competent professional person should be sought.
- It is the objective of the American Occupational Therapy Association to be a forum for free expression and interchange of ideas. The opinions expressed by the contributors to this work are their own and not necessarily those of the American Occupational Therapy Association.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Implementation Tools

Chart Documentation/Checklists/Forms

Patient Resources

Resources

Staff Training/Competency Material

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Living with Illness

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

Watling R, Koenig KP, Davies PL, Schaaf RC. Occupational therapy practice guidelines for children and adolescents with challenges in

sensory processing and sensory integration. Bethesda (MD): American Occupational Therapy Association Press; 2011. 229 p. [401 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

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Not stated

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Not available at this time.

Print copies: Available for purchase from The American Occupational Therapy Association (AOTA), Inc., 4720 Montgomery Lane, Bethesda,

MD 20814, Phone:1-877-404-AOTA (2682), TDD: 800-377-8555, Fax: 301-652-7711. This guideline can also be ordered online at the AOTA Web site.

Availability of Companion Documents

The following are available:

- Occupational therapy practice framework: domain and process. 2nd ed. 2008. Available to order from the American Occupational Therapy Association (AOTA) Web site.
- Davies PL, Tucker R. Evidence review to investigate the support for subtypes of children with difficulty processing and integrating sensory information. American Journal of Occupational Therapy, 2010, 64, 391–402. Available to subscribers from the American Journal of Occupational Therapy Web site.
- Koenig KP, Rudney SG. Performance challenges for children and adolescents with difficulty processing and integrating sensory information: A systematic review. American Journal of Occupational Therapy, 2010, 64, 430–442. Available to subscribers from the American Journal of Occupational Therapy Web site.
- Polatajko HJ, Cantin N. Exploring the effectiveness of occupational therapy interventions, other than the sensory integration approach, with children and adolescents experiencing difficulty processing and integrating sensory information. American Journal of Occupational Therapy, 2010, 64, 415–429. Available to subscribers from the American Journal of Occupational Therapy Web site
- Children and adolescents with sensory processing disorders/sensory integrative dysfunction. CATs (Critically Appraised Topics). Available to members from the AOTA Web site.
- Sensory processing disorders: their effects on learning, behavior, and motor control (AOTA/Dynamic Learning). CME course. Available to order from the AOTA Web site.

In addition, a number of profile and data collection forms are available in Appendices D and F of the original guideline document.

Additional resources, including DVDs, CDs, information for teachers, and continuing education articles, are available to order from the AOTA Web site.

Patient Resources

A variety of tools on the topic of sensory integration, including books and CD-ROMs, are available to order from the American Occupational Therapy Association Web site.

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

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